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Abstract of the national paper of Japan

I. Introduction

1. Japan has been promoting its space activities, including the development of various transportation systems and satellites and participation in international cooperative projects such as the International Space Station programme, to benefit all mankind.

2. The two main space agencies in Japan are the National Space Development Agency of Japan (NASDA), established in 1969, which is the central body responsible for implementing space development programmes and for promoting space utilization, and the Institute of Space and Astronautical Science (ISAS), established in 1981, which is the central body to conduct space science research.

3. Japan's space development is coordinated by the Space Activities Commission, which plans, reviews and decides upon important policies and the overall allotment of responsibilities among ministries involved in space development. It is carried out exclusively for peaceful purposes under the Fundamental Policy of Japan's Space Development. The Fundamental Policy formulated by the Space Activities Commission serves as Japan's basic space development policy, indicating the direction and the scope of space development for about a decade. The basic principles are as follows:

(a) Promotion of creative science research and technology development;

(b) Encouragement of development to meet social needs;

(c) Organization of economically oriented space activities;

(d) Active promotion of international cooperation;

(e) Well-balanced development of manned and unmanned space systems;

(f) Development of the space industry;

(g) Preservation of the space environment.

4. The space development budget of the Government of Japan for fiscal year 1999 is 251 billion yen, a 1.5 per cent increase over the previous fiscal year.

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II. Space activities

A. Earth observation and Earth science

5. Earth observation by satellites contributes a great deal to Earth science and its applications, including weather forecasting, prediction of climate change, monitoring oceanic phenomena, geology, exploration of the Earth's resources, vegetation, agricultural products and the oceanic ecosystem.

6. The Marine Observation Satellite-1 (MOS-1), launched in 1987, was the first Earth observation satellite in Japan and was followed by MOS-1b, the Japanese Earth Resource Satellite (JERS-1), the Advanced Earth Observing Satellite (ADEOS), the Tropical Rainfall Measuring Mission (TRMM) and others.

7. Japan is currently developing the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), to be installed on the EOS AM-1 satellite of the National Aeronautics and Space Administration (NASA) of the United States of America and on ADEOS-II, and the Advanced Microwave Scanning Radiometer-E (AMSR-E), to be installed on NASA's EOS PM-1 and on the Advanced Land Observing Satellite (ALOS).

8. As for weather forecasting, since 1977, Japan has launched a series of geostationary meteorological satellites, the data from which are used also in Asian and Oceanic countries. The follow-on satellite, the Multi-functional Transport Satellite (MTSAT), will be launched in 1999 with an added mission for air traffic services.

9. The Frontier Research System for Global Change, established in 1997, conducts research on global change mechanisms and model development using satellite data in the field of Earth science.

B. Space science

10. Space science is pursued in order to enrich the intellectual heritage of humankind and challenges us to solve fundamental questions about how the universe was born, how it evolved and what it will be like in the future.

11. At present, six scientific missions are ongoing in Japan, Akebono, Yohkoh, Geotail, Asca, Halca and Nozomi. The success of the very long base interferometry (VLBI) space satellite Halca (or Muses-B) and the first Japanese Mars orbiter Nozomi (or Planet-B) indicates that Japan's space science activities have entered a new era and that Japan is ready to tackle more ambitious projects, including lunar/planetary exploration.

12. Future missions are Lunar-A, for the exploration of the internal structure of the Moon, Astro-E, for the observation of black holes and active galaxies, Muses-C, for asteroid sample return, Astro-F, for infrared astronomical observation, Solar-B, for observation of the Sun, and Selene, for investigation of the Moon.

III. Space utilization and manned space flight

13. The space environment is characterized by microgravity and high vacuum. Research on how to utilize the space environment will contribute significantly to acquiring new scientific knowledge and creating key technologies. Japan performs space environment utilization experiments using small rockets, recoverable capsules, the United States space shuttles and an unmanned space experiment system, including the Space Flyer Unit launched in 1995 and the Unmanned Space Experiment Recovery System, to be launched in 2001.

14. In the International Space Station programme, Japan provides the Japanese Experiment Module (JEM), which is Japan's first orbital laboratory. JEM is expected to play a central role in the construction of an integrated research structure, which closely links research activities both in space and on the ground. The development of JEM is being undertaken with a view to its launch aboard three United States shuttle flights starting in 2002.

15. Manned space activities have significant implications in terms of exploring the possible expansion of human activities, acquiring new scientific knowledge and pursuing effective space utilization. Experience and know-how about crew selection, training and health care have been accumulated during the development and operation of JEM and the use of United States space shuttles.

D. Communications, broadcasting and positioning

16. Communications, broadcasting and positioning are three of the most familiar forms of space utilization in daily life. Historically, space activities in communications and broadcasting were undertaken mostly by the Government. However, since 1989, the private sector has successfully launched several communications satellites and many telecommunications companies have engaged in the communications business and the communications satellite broadcasting business. At present, analog broadcasting services are being provided via broadcasting satellites, and digital broadcasting using such satellites will start at the end of 2000.

17. To date, experiments on and developments in advanced communications and broadcasting technologies using the Engineering Test Satellites (ETSs) and the Communications and Broadcasting Engineering Test Satellite (COMETS) have been promising. ETS-VIII will be launched in 2002 for mobile broadcasting and other purposes. In addition, Japan is now promoting research and development on an ultra-high data-rate satellite communications system, a global multimedia mobile satellite communications system and others.

18. The Global Positioning System (GPS) is widely used in Japan in such fields as aeronautical/maritime/vehicle navigation, diastrophism observation, construction and surveys. Japan is developing basic technologies to improve positioning accuracy and is considering the possibility of international cooperation projects.

E. Space infrastructure

19. The expansion, sophistication and advancement of space activities require that Japan strengthen its space infrastructure in order to ensure the unrestricted deployment of its own space activities. The efforts made to date have resulted in the H-II, J-I and M-V launch vehicles, by means of which Japan has acquired a wide variety of launch capabilities. Japan is now developing H-IIA, to meet diversified launch demands in the twenty-first century at lower cost, Hope-X, with a view to accumulating technology for future reusable transportation systems, and the H-II transfer vehicle, to supply logistics to the International Space Station.

20. Key technologies necessary for flexible space activities in the future, such as unmanned rendezvous docking experiments and space robotics experiments, are being conducted using ETS-VII and the technologies necessary for data relay satellite networks are being acquired through ETS-VI, COMETS and the Data Relay Test Satellite (DRTS).

F. Space industry

21. The turnover of the space industry in Japan in fiscal year 1997 amounted to about 378.5 billion yen, an 11.8 per cent increase over the previous year, and there were 9,500 "space" employees in 1997. Since the Japanese space industry was not competitive because of high costs and lengthy lead times, space product exports were limited to parts and

components. Recently, however, a Japanese company received an order for a geostationary Earth orbit satellite and orders from foreign companies for several commercial launch services using the H-IIA rocket.

22. Japan is now developing the Space Environment Reliability Verification Integrated System to monitor commercial off-the-shelf parts and technology under severe space environment conditions in order to enlarge the space market by cheaper, faster and better commercial off-the-shelf technology.

IV. International cooperation in space activities

23. Japan believes international cooperation in space activities is becoming increasingly important and actively seeks to promote international cooperation, aimed at obtaining space benefits for all human beings, by playing a major role in the development of space technology and its applications.

A. Multilateral cooperation

24. In 1981, Japan formed the Inter-Agency Consultative Group for Space Science with the principal space agencies conducting space science research in Europe, the Russian Federation and the United States. Japan also continues to contribute to the Committee for Earth Observation Satellites by exchanging information among countries, as one of the secretariat countries of the Committee. Japan has held the Asia-Pacific Regional Space Agency Forum for international cooperation on space activities among countries in Asia and the Pacific since 1993.

25. Japan has implemented the PARTNERS project with five Asian countries, which has introduced tele-education and tele-medicine and contributed to the training of scientists and researchers in those countries and to the transfer of technology. The second phase of the Post-PARTNERS project is now being implemented.

26. Japan also prepares the Global Map, which provides the core data in the Geographic Information System for the environment in some Asian countries. As one of the 15 partner States in the International Space Station programme, Japan plays an important role in the programme, as mentioned before.

B. Bilateral cooperation

27. Japan has cooperated with many countries, including Canada, France and the United States, and with the European Space Agency, in fields such as Earth observation, space science and space utilization. Japan has also directed cooperative efforts with countries in the region of Asia and the Pacific, especially in the area of Earth observation in direct reception, pilot projects, seminars, workshops and the like.

C. Others

28. In addition to the cooperation projects mentioned above, the Japan International Cooperation Agency dispatches experts to developing countries and provides training courses for young scientists and researchers from developing countries. Training assistance for young scientists and researchers is also provided by the Government of Japan and the Japan Society for the Promotion of Science contributes to the training of scientists and researchers in developing countries.